

**What is claimed is:**

1. A method of fabricating a flash memory device comprising the steps of:

5 forming a tunnel oxide layer on a semiconductor substrate,  
the material of the tunnel oxide layer having a  
conduction band energy level lower than that of SiO<sub>2</sub>;  
forming a floating gate on the tunnel oxide layer;  
forming an intergate dielectric layer on the floating  
10 gate;  
forming a control gate on the intergate dielectric layer;  
forming a gate electrode by patterning the tunnel oxide  
layer, the floating gate, the intergate dielectric layer,  
and the control gate; and  
15 forming a source/drain region by performing an ion  
implantation into the substrate using the gate electrode  
as a mask.

2. The method as defined by claim 1, wherein the tunnel  
oxide layer is made of one selected from the group  
20 consisting of Y<sub>2</sub>O<sub>3</sub>, Al<sub>2</sub>O<sub>3</sub>, HfO<sub>2</sub>, and ZrO<sub>2</sub> with a  
conduction band energy level lower than that of SiO<sub>2</sub>.

3. The method as defined by claim 1, wherein the step of  
forming the tunnel oxide layer comprises the steps of:  
forming a first tunnel oxide layer on the semiconductor  
25 substrate; and  
forming a second tunnel oxide layer on the first tunnel  
oxide layer.

4. The method as defined by claim 3, wherein the first  
tunnel oxide layer is made of one selected from the  
30 group consisting of Y<sub>2</sub>O<sub>3</sub>, Al<sub>2</sub>O<sub>3</sub>, HfO<sub>2</sub>, and ZrO<sub>2</sub> with a  
conduction band energy level lower than that of SiO<sub>2</sub>.

5. The method as defined by claim 3, wherein the second  
tunnel oxide layer is made of one selected from the  
group consisting of Y<sub>2</sub>O<sub>3</sub>, Al<sub>2</sub>O<sub>3</sub>, and SiO<sub>2</sub> with a

conduction band energy level equal or similar to that of  $\text{SiO}_2$ .

6. The method as defined by claim 3, wherein the first tunnel oxide layer is deposited more thickly than the second tunnel oxide layer.

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